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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Salvatore Pavone

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EXAMINER

BLAN, NICOLE R

ART UNIT

PAPER NUMBER

1792

NOTIFICATION DATE

DELIVERY MODE

05/30/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

uspto@ti.com  
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<b>Office Action Summary</b>	<b>Application No.</b> 10/607,905	<b>Applicant(s)</b> PAVONE, SALVATORE	
	<b>Examiner</b> NICOLE BLAN	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 April 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 16-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 16-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. The amendments to claim 1 filed on April 28, 2008 have been acknowledged.
2. Currently claims 1-8 and 16-20 are pending.

### ***Response to Arguments***

3. Applicant's arguments filed April 28, 2008 have been fully considered but they are not persuasive.

In response to applicant's argument regarding single wafer processing tools versus batch or multiple wafer processing tools, the examiner respectfully disagrees. The paragraph cited in the instant application does not support the view that the method of cleaning a single wafer wouldn't work on batch or multiple cleaning processes, it merely states it would require more time for cleaning in batch or multiple wafer mode. Applicant's arguments appear to be contradictory according to what is known in the art as cited by McDermott (please refer to the detailed discussion below). The examiner would like to note that the position written in the prior office actions dated March 7, 2007 and November 29, 2007 were correct in their position, and that the McDermott reference is being cited to further support that position.

In response to the Applicant's argument regarding the three step cleaning, the examiner respectfully disagrees. The repeating of the first cleaning process of Law does in fact constitute a second cleaning process because there was a factor that determined an end to the first process which in turn resulted in the repeating the cleaning a second time. Thus, the disclosed "second cleaning" of Law does in fact read on the third step of the cleaning process in the instant

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application. Furthermore, there are no linking terms claimed to distinguish when each of the cleanings take place. Therefore, the prior art of record reads on the claimed limitations.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**6. Claims 1, 2, 4, 5, 7, 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seamons et al (U.S. 6,060,397), in view of Law et al (U.S. 4,960,488), and further in view of McDermott et al. (U.S. PGPub 2004/0055621).**

Seamons teaches an in-situ cleaning of residues for a CVD chamber comprising introducing a fluorocarbon gas under the certain cleaning conditions inside the chamber and detecting endpoint of cleaning. As a fluorocarbon gas, C<sub>3</sub>F<sub>8</sub> is specifically recited (col.4, lines 30-34; col. 10, lines 26-36, 48-62). Seamons also indicates that the cleaning method may be performed using a multi-step cleaning process wherein electrode spacing is adjusted to

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selectively clean inner and outer surfaces of the interior wall of the chamber and other surfaces.

While indicating a multi-step cleaning process, Seamons remains silent about maintaining the pressure during the cleaning in the way specified in the instant claims 1 and 16.

Law teaches an effective multi-step CVD chamber self cleaning process, which includes adjusting the electrode spacing in order to selectively clean electrodes and nearby chamber components under high pressure (localized cleaning) and clean the more distant areas of the chamber at lower pressure, wherein cleaning electrodes and nearby chamber components under the high pressure is repeated a number of times (reads on “a first cleaning step” and “a second cleaning step” as instantly claimed) before the lower pressure cleaning (reads on “a third cleaning step”, as instantly claimed) is performed (col. 2, lines 17-21; paragraph, bridging col. 11 and 12; col.15, lines 3-5).

Therefore, since Seamons is concerned with multi-step cleaning of CVD chamber and Law provides the sequence of processing steps to effectively clean the CVD chamber, one skilled in the art motivated by Law would have found obvious to utilize the sequential processing steps of Law in order to effectively clean residues from interior surfaces of CVD chamber in the multi-step cleaning process of Seamons with the reasonable expectation of success.

Law and Seamons remain silent about a chamber having multiple substrate stations. However, McDermott teaches that treatment of multiple substrates is known in the art (page 1, paragraph 160), one skilled in the art would have found obvious to utilize a deposition chamber with multiple substrate treatment stations in lieu of the CVD chamber of Seamons, if processing a number of similar substrates under similar processing conditions are required, and perform

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cleaning of such chamber as per teaching of Seamons/Law in order to enhance production output and provide cost efficient processing.

With regard to claim 16, while teaching the steps of placing (transferring) a wafer (substrate) into CVD chamber, depositing material layers on the wafer (paragraph, bridging col. 3 and 4) and cleaning the CVD chamber in multiple steps, Seamons remains silent about transferring a plurality of substrates into a deposition chamber having multiple substrate stations. However, McDermott teaches that treatment of multiple substrates is known in the art (page 1, paragraph 160), one skilled in the art would have found obvious to utilize a deposition chamber with multiple substrate treatment stations in lieu of the CVD chamber of Seamons, if processing a number of similar substrates under similar processing conditions are required, and perform cleaning of such chamber as per teaching of Seamons/Law in order to enhance production output and provide cost efficient processing.

With regard to claim 4, since the first and second cleaning steps of Seamons/Law are used for localized cleaning, and cleaning time depends on frequency of cleaning steps and particular deposits to be removed, thus representing result effective parameter, it is within the skills of the ordinary skilled in the art to establish a proper time for such cleaning to obtain the optimum performance of CVD processing equipment. With regard to the limitation reciting that a duration of the third cleaning step is a function of the duration of the first cleaning step, one skilled in the art would have found obvious to establish such function since the third cleaning step is used as the final cleaning step, the effectiveness of which obviously depends on the cleanness of the localized areas of CVD chamber, performed by the first cleaning step.

With regard to claim 5, since Law teaches cleaning of extended chamber area under higher pressure, one skilled in the art would have found obvious to raise the pressure in the second cleaning step to extend the cleaning area upon first cleaning step in order to reduce total chamber cleaning time, thus enhancing output of the CVD processing equipment.

With regard to claim 17, Seamons suggests to connect a selected particle count threshold limit with selected deposition rate (paragraph bridging col.5 and 6).

With regard to claim 18, Seamons teaches a wipe clean out of the CVD chamber. As to the limitations of claims 19 and 20, it is within the skills of the ordinary skilled in the art to determine the thickness of the deposits and the number of deposition hours upon which the cleaning must be effectuated.

**7. Claims 3, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seamons et al (U.S. 6,060,397) in view of Law et al (U.S. 4,960,488) and in further view of Richardson et al (U.S. 7,028,696).**

With regard to claim 3, Seamons teaches CVD chamber cleaning wherein endpoint is determined by monitoring optical emissions from fluorine (col. 5, lines 33-39; col. 6, lines 35-67; col. 7, lines 1-5). Seamons remains silent about monitoring optical emission from carbon monoxide. However, monitoring optical emission from carbon monoxide is utilized in the art wherein oxygen is also used for chamber cleaning. Thus, Richardson teaches monitoring optical emission to detect endpoint of chamber cleaning. In addition to monitoring optical emission from fluorine, Richardson specifically indicates monitoring optical emission from carbon monoxide

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upon using oxygen for chamber cleaning, which leads to the formation of carbon monoxide (col. 11, lines 19-49).

Therefore, since Seamons/Law teach the use of gaseous cleaning mixture containing oxygen and Richardson teaches the chamber cleaning process utilizing oxygen and monitoring optical emission from carbon monoxide for determining the endpoint of chamber cleaning, one skilled in the art motivated by Richardson would have found obvious to monitor optical emission from carbon monoxide in addition to fluorine in order to precisely determine the endpoint in CVD chamber cleaning process of Seamons/Law.

The teaching of Seamons/Law remains silent about controller, as specified in claim 8. However, computerized process controllers are conventionally utilized in the art. Thus, Richardson teaches two step chamber cleaning operation controlled by computer to automatically start the wafer-less plasma cleans at set wafer processing intervals. The process parameters are input as a recipe and the process parameters are controlled by a system, such as a programmable logic controller that interfaces with the reaction chamber. Therefore, one skilled in the art motivated by Richardson would have found obvious to utilize a controller to automate and enhance efficiency of the multi-step chamber cleaning processing of Seamons/Law.

**8. Claim 6 is are rejected under 35 U.S.C. 103(a) as being unpatentable over Seamons et al (U.S. 6,060,397) in view of Law et al (U.S. 4,960,488) and in further view of Cheung et al (5,158,644).**

Seamons/Law do not specifically indicate flow rates of fluorocarbon as instantly claimed. However, since the flow rates of cleaning gases are result effective, discovery of optimum value



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of result effective variable in known process is ordinarily within the skill in the art and would have been obvious. Besides, such rates are conventionally used in the art while cleaning CVD chamber with fluorocarbons. Thus, Cheung teaches two-steps cleaning of CVD chamber, wherein the same fluorocarbon is used in both steps and wherein the flow rates of fluorocarbon correspond to the instantly claimed values (col.6, lines 36-45). Therefore, one skilled in the art would have found obvious to utilize the fluorocarbon flow rates of Cheung while cleaning the CVD chamber in the process of Seamons/Law with the reasonable expectation of success.

### ***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICOLE BLAN whose telephone number is (571)270-1838. The examiner can normally be reached on Monday - Thursday 8-5 and alternating Fridays 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

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like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. B./

Examiner, Art Unit 1792

/Alexander Markoff/

Primary Examiner, Art Unit 1792